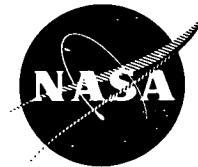


NASA TECH BRIEF

Lewis Research Center



NASA Tech Briefs announce new technology derived from the U.S. space program. They are issued to encourage commercial application. Tech Briefs are available on a subscription basis from the National Technical Information Service, Springfield, Virginia 22151. Requests for individual copies or questions relating to the Tech Brief program may be directed to the Technology Utilization Office, NASA, Code KT, Washington, D.C. 20546.

An Experimental 100 Kilowatt Wind Turbine Generator

By agreement with the National Science Foundation (NSF) and the Energy Research and Development Administration (ERDA), the NASA Lewis Research Center is providing management for the development of large (50 to 3000 kW) wind-driven electric power generating systems. The first element in this project consists of an experimental 100 kW wind turbine generator which has been designed and built, and which is being operated to produce engineering data for use throughout the program and to provide a test bed for subsequent components and subsystems.

The experimental 100 kW wind turbine generator consists of two blades each 18.75 meters (62.5 feet) long, mounted on a tower 30 meters (100 feet) high, driving a transmission train and an electric generator mounted on top of the tower. The machine generates 100 kW of electricity at wind speeds from 7.9 meters per second (18 miles per hour) to 26 meters per second (60 miles per hour) with the blades rotating at 40 revolutions per minute. A blade pitch control mechanism automatically maintains constant rotational speed and therefore constant power output within this wind speed range. At wind speeds from 3.5 meters per second (8 miles per hour) to 7.9 meters per second (18 miles per hour), the electric power generated is a function of the wind velocity. A yaw control mechanism automatically orients the machine into the wind.

As our national energy needs increase and supplies of oil and gas become more expensive, alternative energy sources are being investigated and, where practical, developed. Wind energy, a clean nondepletable source of energy that has proven practical in the past, is one such alternative source. Wind energy systems have been used for centuries to provide energy for uses ranging from pumping water and grinding grain to, more recently, generating electricity. From 1930 to 1960, considerable interest existed in Europe, and in the 1940s in the United States, in developing large wind-driven generating systems as sources of electric power. Interest in these systems declined because they were not cost competitive with the fossil fuel central power systems of that era. These efforts

were generally individual projects and were not supported by a sustained research and development program. The NASA Lewis Research Center is participating in the national wind energy program by applying its expertise in aerodynamics, materials, electric power systems, and management techniques.

The Lewis Research Center wind energy project consists of three major elements: (1) design, construction, and testing of an experimental 100 kW wind turbine generator (described above); (2) development of industry-designed, electric utility-operated wind turbine generator systems; and (3) supporting research and technology for wind turbine generator systems. The objective of the first element is to produce engineering data for use throughout the project and to provide a test bed for subsequent components and subsystems. The objective of the second element is to involve industry and users in the design and operation of wind turbine generator systems capable of supplying electric power to existing utility power networks at costs competitive with conventional generating systems. Industrial firms and electric utilities throughout the United States have been invited to participate. The objective of the third element is to evolve the technology to reduce the capital and operating costs of wind turbine generator systems, and concurrently to improve their performance, reliability, and service life. Included are investigations of energy storage systems.

Notes:

1. Further information on the design, construction, and operation of the experimental 100 kW wind turbine generator is included in the following report:

NASA TM-X-71701 (N75-21795), Plans and Status of the NASA-Lewis Research Center Wind Energy Project

Copies may be obtained at cost from:
Technology Application Center
University of New Mexico
Albuquerque, New Mexico 87131
Telephone: 505-277-3622
Reference: B75-10147

(continued overleaf)

2. Specific technical questions may be directed to:

Technology Utilization Officer

Lewis Research Center

21000 Brookpark Road

Cleveland, Ohio 44135

Reference: B75-10147

Source: R.L. Thomas, R.L. Puthoff,
J.M. Savino and W.R. Johnson
Lewis Research Center
(LEW-12509)